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PRINCIPLES OF ORGANIZATION APPLIED TO RESEARCH AND DEVELOPMENT BUREAU OF AERONAUTICS NAVY DEPARTMENT

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PREFACE

This paper outlines certain principles of organization and then compares industrial concepts with the actual organization of research and development activities in the Bureau of Aeronautics. Certain organizational concepts have proven successful in administration of industry and government. The object of this paper is to visualize how these successful features are utilized or could be utilized in an aircraft engineering organization.

The author is aware that serious consideration is being given in a review of certain proposals for a reorganization of the present Research and Development organization in the Bureau of Aeronautics. Several of the suggested plans have been made available for background material for this paper. An attempt is made to be constructive in this paper and produce a recommended organization.

CHAPTER I

INTRODUCTION

The basic objective of the Research and Development Organization, Bureau of Aeronautics is to develop the best aircraft weapon system for delivery of destruction against a target. The aircraft weapon system can be an aircraft with its armament - guns, rockets, mines, atomic weapons, bombs, or guided missiles. Of course, the weapon system could be all inclusive as a ship launched guided missile. Supporting aircraft equipment and shipboard equipment are included in the developmental responsibilities of the Bureau.

The problem organizationally faced by the Bureau as well as by industry is that the aircraft weapon system concept requires that all components be matched precisely or the system will not perform effectively. The present system of operation of the research and development activities has not changed materially since 1946. We know that industry has made several changes in management and organizational structure to match the problem. Similarly the Bureau of Aeronautics has made several organizational studies with some action considered imminent.

The procedure in this paper will be to delineate the important elements of organization and compare the organization in the Bureau of Aeronautics to this yardstick.

Consideration will be given to known managerial concepts of industry. Proposed reorganizational plans of the Research and Development organization have been analyzed, and a recommended organizational structure will be developed.

CHAPTER II

PRINCIPLES OF ORGANIZATION

It is important to realize that organization is just the first attack on sound management.[1] The elements of administration generally recognized as being the consensus of the writers on this subject are forecasting, planning, organization, coordination, command and control.[2] Therefore, organization becomes the structure which provides the paths for management to communicate effectively with the personnel. Whereas a machine requires the application of sound engineering principles for successful operation, an organization depends on fundamental management principles for effective administration.

There are many principles or elements of organization listed by such authorities as Fayol, Urwick, Mooney, Lamperti and others. In this study, only a few major items will be used and discussed. It should be emphasized that general principles are listed on the basis that they have been found useful with the full realization that many principles are violated by successful organizations in separate instances. So long as we have different organizational problems and strong personalities, we cannot expect universal application of any set of guiding principles.

[1] John V. van Pelt III, "How Some Companies are Planning and Controlling Their Operations", The Controller, (December 1955) pp. 571.

[2] Urwick, Elements of Administration, New York, Harper Brothers, 1942, p. 19.

Delineation of Duties. The element of clear cut delineation of duties is specified in order to avoid duplication and overlapping functions. Frequently, one hears the complaint about weaknesses in this category laid to the implication of "politics." Actually, politics may not be the correct charge at all, and we should look to the inattention by management to subordinate functions, which in turn permits lost motion and continual conflict.

Delegation of Authority. The experts frequently disagree on whether responsibility can be delegated along with authority. However, it is agreed that each echelon in the organization should be delegated adequate authority and accountability.

Span of Control. It is generally said that an executive can supervise effectively from three to seven subordinates. We know that this number varies according to many circumstances. However, the more diverse the functions of the subordinates, the less the number that can be supervised by one person. In a research and development organization, with many highly specialized functions, the span of control of an executive is much less than that of a manager supervising identical units like chain stores. It should be remembered that for each additional subdivision on a level below the executive, there results multiple combinations of problems with each other subdivision on the same level.

Centralization vs Decentralization. The problem whether to utilize centralized or decentralized control depends on the company, its size, number of diverse products and the territories of operation.[1] Generally, a decentralized organization is most profitable. The larger the organization, the more diverse its products, and territories, the more necessary it is to use a decentralized organization. A small group can profit by centralized control, with speed in making decisions, and also retain initiative throughout management.

Line and Staff. Most organizations utilize a combination of line and staff personnel. The line makes the decisions and takes action. The staff should be very careful not to usurp the power of the line. The staff provides an advisory function to the executive. The staff transmits information, interprets orders, and follows up on action taken. A military organization recognizes three types of staffs - a personal staff, chauffeur and yoeman; a general staff concerned with plans and policies; and a technical staff of specialists who advise in their specialty and follow up on action directed.

Specialization. A single primary function is ideal and clear-cut organizationally. However, an organization of

[1] Simon, Herbert A. "Centralization and Decentralization" The Controller, January 1955. p. 19.

many specialized functions requires a horizontal type of organization with the different functions on the same level. An additional layer of supervisory personnel for control purposes then becomes necessary. Additional levels have the effect of moving initiative higher up in the organization and away from the operators or doers.

Committees. Generally, organization by committee is an expensive method of operation in money and manpower. Committees are used for integrating group judgment when qualified personnel are available and clarification and broader outlook are necessary. Committees are not used for decision making when speed is vital.[1]

The above principles of organization are only a few of those that could be named; however, it is felt that the list includes the major principles useful to this study. At least the above mentioned principles appear the most often in the various publications reviewed by this writer.

[1] Newman, William H., Administrative Action (New York, Prentice-Hall, Inc., 1951) pp. 217-231.

CHAPTER III

ORGANIZATION OF BUREAU OF AERONAUTICS RESEARCH AND DEVELOPMENT

The Research and Development organization of the Bureau of Aeronautics is directed by an Assistant Chief of the Bureau operating under the Chief and Deputy Chief of the Bureau of Aeronautics. In the latest organization chart approved 10 February, 1954, there is listed an Executive Director and seven Special Assistants in the Office of the Assistant Chief for Research and Development.[1] The Executive Director acts as principle advisor and Acting Assistant Chief when necessary. The Special Assistants are listed as follows:

Executive Assistant assists the Executive Director with particular emphasis on coordination and supervision of airborne equipment, electronics, and armament programs.

Special Assistant acts in executive administration of matters pertaining to personnel, space, organization, security, and visits by foreigners.

OASD (Office of Assistant Secretary of Defense) Research and Development Liaison and Technical Assistant acts as a liaison officer for research and development matters pertaining to committees and organizations outside the Bureau.

[1] Bureau of Aeronautics Organization Manual, Washington: Navy Department, 1952, pp. 73-207.

Anti-Submarine Warfare Liaison Officer acts as a technical advisor and coordinator in Anti-Submarine Warfare matters within and outside the Bureau.

Aircraft Nuclear Propulsion Liaison Officer acts as a liaison officer on nuclear propulsion matters for the Bureau.

Administrative Assistant manages the clerical matters for the Office of the Assistant Chief.

It is realized that some changes in alignment and duties of the Special Assistants may have been made since the last organization chart; however, the general fields of interest are similar to the above.

The Assistant Chief for Research and Development has thirteen divisions reporting to him. Some divisions are much larger than others, and the requirements for supervision vary with the scope and complexity of the programs prosecuted. The individual divisions are listed as follows:

Aeronautical Standards Group performs standardization work in requirements and specifications with other governmental organizations.

Airborne Equipment Division is responsible for development and installation in aircraft of equipment, instruments, and navigational equipment.

Aircraft Division coordinates development of all aircraft covered by six aircraft branches.

Airframe Design Division controls aerodynamic and structural requirements of aircraft.

Armament Division is responsible for development and installation of armament items including fire control systems in aircraft except guided missiles.

Electronic Division is charged with the development and installation of electronic equipment not assigned other divisions in aircraft.

Evaluation Division makes recommendations on all new aircraft and guided missile proposals.

Guided Missile Division is responsible for development of Bureau of Aeronautics missiles.

Power Plant Division coordinates development of power plants, fuels, and accessories, excluding rocket engines.

Research Division conducts analytical studies related to aircraft design.

Ship Installations Division coordinates the development of shipboard launching and recovery equipment for aircraft.

Technical Data Division coordinates specifications and supplies technical publications to aircraft activities.

Experimental Program Division coordinates the Research and Development budget program and the assignment of projects and support to Bureau of Aeronautics activities (field).

CHAPTER IV

EVALUATION OF BUREAU OF AERONAUTICS RESEARCH AND DEVELOPMENT ORGANIZATION

The basic objective of the Research and Development Organization of the Bureau of Aeronautics is considered by this writer to be the contracting for the development and engineering coordination of the best aircraft system including guided missiles, shipboard launching and recovery equipment, and aircraft instrumentation for use by Naval personnel. However, the classification of the duties of the Research and Development Divisions are most often described by the terms "research", "design", "development", "test", "evaluation", and "installation". These words do not indicate the relative emphasis on the various duties performed by the personnel of the organization.

As an aid to bringing the duties performed by the personnel into focus, the following outline of duties are submitted as a simplified basis for discussion of the performance of the Research and Development personnel. Using the design or class desk group as a model, the following categories of effort, based upon the author's experience are submitted:

Survey of Trends. This category includes keeping abreast of research and development progress in research organizations, industry, the Air Force, and foreign countries.

Contracting for New Designs. This item covers the preparation of specifications, analysis of operational requirements, design competitions and the contracting for prototype aircraft, guided missiles, and equipment.

Test and Evaluation. The duties here cover laboratory and flight test efforts of both the contractor and government facilities.

Engineering Supervision. This phase includes standardization, installation, improvements, changes, training and service problems with production aeronautical material.

The above over-simplification or breakdown of effort primarily applicable to the aircraft design desks is also representative of effort in component divisions who contract for the development of equipment. Rather than attempt to assign relative percentages of effort to the above categories, emphasis on the various items can be viewed by another method. Engineering supervision requires considerable time, possibly half the man-hours in a division since a weapon system is in service usage over a long and active period. This engineering supervision continues the life of the product since the personnel classifiers prevent the use of engineering billets in the Maintenance and Production Divisions.

Whereas Engineering Supervision requires a large amount of time and effort, the Survey of Trends is a continuing effort on a small scale. Contracting for New Designs and Test and Evaluation could be considered to fall somewhere in between in allocation of effort. If Engineering Supervision requires fifty percent of a Division's man hours, and Survey of Trends ten percent, the remaining forty percent could be divided almost equally between the other two categories.

The above classification of effort is submitted merely as a sample of how the duties of personnel might be delineated, since it would provide a method of describing duties as applied to actual performance. This basic outline would also apply to the Component Divisions since the development of a bomb rack, a navigation system, or a power plant would occur in the same sequence.

With an understanding of the type of duties performed in the Research and Development Divisions, that is monitoring of research and development efforts, but primarily engineering supervision of contractors' equipment in service, an evaluation of the organization in accordance with recognized principles can be undertaken.

Delineation of Duties. The verbiage of the General Statement of Functions of the individual Research and Develop-

ment Divisions has without doubt been checked to prevent overlapping functions and duplications. However, despite certification of divisions concerned, there exist inconsistencies, interlocking agreements, and phrases subject to many interpretations.

As an example, the statement in the Armament Division Functions excluding that division from the installation of guided missiles on aircraft was inserted with the full knowledge that the Guided Missile Division lacked personnel and would exercise the authority in name only, although the Aircraft Division, with a similar responsibility did not require such a stipulation. The wording exists on the insistence of Guided Missile personnel and was agreed to by the Armament Division in order to gain support on a fire control cognizance problem in a companion directive.

Since the organization of Research and Development is under review, no further proof need by furnished at this time as to the fact that there does exist a problem in reference to the organizational requirement for clear cut delineation of duties. In actual practise, many problems have arisen during the past few years which have been resolved to some degree by the patchwork method of revision of functions. No doubt, similar problems, or the same ones, will continue to arise as personnel change and unwritten agreements are forgotten.

Delegation of Authority. We frequently hear the complaint that many key people are loaded down with paper work so that it is difficult to find time to think. This would indicate a weakness in delegation of authority, especially if we believe the Chinese proverb that states that all executives should be a trifle lazy so that they will delegate authority and thus enable their key employees to perform their best work.[1]

In the Research and Development Organization, all divisions are on the same level organizationally. However, the aircraft design desks are one echelon below the component divisions. On the other hand, the design desks have historically been the key coordinating organization of the Bureau. Thus, the Fighter Design Branch, since 1946, has slipped down one echelon in authority, although its accountability and duties have not diminished in importance. The ability of the design groups to make decisions in conformance to its coordinating responsibility has deteriorated.

The lines of authority should, of course, be clear-cut and recognizable. However, the mixture of officer and civilian billets in the various divisions does not appear to follow any standard format. Certain divisions, like Armament, have a military type of organization with officers in key billets and no officers reporting to civilians other than for technical guidance. Other divisions have civilians in key billets to whom officers report. Other civilians in assistant type

billets exercise control over lower echelon officer billets wither by usurption of authority or acquiescence of a military superior. The implication in the latter situation is that the military boss is not clear as to the delegation of authority to civilian and military personnel.

Organizationally, the lines of authority are specified by the Organization Manual. However, the delegation of authority can be improved. Authority should be delegated commensurate with the accountability of the group at the proper level of responsibility. This does not appear to be the case for the design branches. Also, the civilian-military line of command does not appear to be uniform in the divisions. The use of Deputy versus Assistant titles might be clarified.

Span of Control. It appears that the Research and Development Organization departs from accepted standards of span of control. Thirteen divisions now report to the Assistant Chief as well as seven Assistants. With the type of highly specialized divisions which one finds in the Bureau of Aeronautics, the accent should be on a much lower number of subordinates, rather than almost double the maximum number of functional divisions considered acceptable.

Centralization vs Decentralization. It appears that the Assistant Chief of Research and Development operates with centralized control in that so many Division Directors report directly to him. There is definite merit in this

arrangement in that all Divisions are located in the same area. However, the Division Directors enjoy only a fair degree of initiative. Also, there are so many Directors of Divisions that speed of decision making is delayed due to the demands on the time of the Assistant Chief. An additional loss of the advantage of centralization is attained by the fact that the most effective coordinating groups, the design desks, are removed from a close relationship with the Assistant Chief and are located a level below the Division Directors.

Line and Staff. Four of the Research and Development Divisions are listed as staff Divisions; the other nine as line Divisions. The Staff Divisions are listed as Research, Evaluation, Technical Data and Experimental Programs. There is no question about the desirability of highly specialized Divisions acting in an advisory capacity to the Assistant Chief, but should they not also provide services for the line divisions on an organizational level an echelon below the operating divisions. If the principal staff function of these four divisions is to provide services for the line divisions as stated in the Organizational Manual, then the staff organization should be an echelon below the line divisions. Actually, it would appear that the staff divisions are located properly as advisors to the Assistant Chief but then the organizational and management policy should be re-stated.

There is some question as to whether other line divisions such as Airframe Design, Airborne Equipment, Power Plant, Electronics, and Armament might be considered highly specialized functional divisions and therefore should act as staff divisions to the Aircraft and Guided Missiles Divisions. Since these Divisions prosecute complete programs from design through production engineering, they are line divisions. The Ships Installation Division can be considered a separate line division on its own merits and responsibilities. If certain line divisions exist to provide technical services for other line divisions, an inconsistency then exists in the organizational structure, unless coordination between divisions is active on the working level.

Specialization. There are named many divisions which represent specialized functions, and both staff and line divisions are spread across the board in a horizontal type of organization. The Organization Manual recognizes that the Aircraft and Guided Missile Divisions cut across the board in their assigned coordinating functions. Other than words written in the functions of the divisions, the organizational structure and higher seniority of personnel assigned to technical divisions does not match actual operation of the divisions.

Committees. Most personnel have the opinion that

there are too many committees and agree with the fact that much wasted time and effort is lost in committee action. Research and Development Divisions are members of many inter-Bureau, inter-Service, Office of Naval Operations and Secretary of Defense Committees. There does not appear to be an undue number of purely intra Research and Development Organization Committees in the Bureau.

No doubt any recommendations to cut down committees would be looked at with interest, whereas an increase in committees would require strong representation. Amalgamation or elimination of the numbers of Research and Development Divisions would definitely serve to reduce membership and wasted time at such meetings as Research and Development, Bureau of Aeronautics and Chief of Naval Operations Directors meetings. No doubt many directors have found that their time has been wasted at such meetings and that other divisions presented the same news item as they were prepared to do. When the minutes of the meeting are given broad distribution, information is easier to read in much less time than attending the meeting.

On the other hand, there does not appear to be any medium such as a committee to provide an accent on planning in Research and Development. Apparently, planning in Research and Development is based on individual thinking, wherein a program is outlined and it is assumed that all

contingencies have been visualized. However, scientific management techniques require that all possible contingencies be weighed, best estimates, best thinking, and unbiased human motivation be utilized.

A summary of the findings in evaluation of the Research and Development Organization is as follows:

1. Within the responsibilities of the Chief of Bureau of Aeronautics to provide the service with optimum operating aircraft and guided missiles, the Research and Development group has key duties which are broader than exist within the divisions. The group is not a self-sufficient command in that it relies on other divisions for such functions as planning, production and maintenance. On the other hand, it provides engineering coordination for organizations like Maintenance and Production who are outside its control. It could be viewed as a key line organization weak in planning, with major duties in engineering coordination, and lacking in budgetary integration.

2. In regard to planning, there is much evidence to prove that new development planning takes place in the various divisions, but one can not find a coordinated planning effort on the part of the Research and Development organization.

3. Personnel who operated in and with the class desk organization during World War II recognize that the present organization has lost the avenue of direct communication and

and coordination with the component divisions. This represents a weakness in decision making. Pilots in the class desk are prone to buy attractive engineering proposals by contractors, since the means of coordinating with the engineering divisions is time-consuming and difficult.

4. Without an integrated plan, but operating with a collection of Research and Development projects in the budget, it is clear how the budget has become an ineffective control for Research and Development management. Especially where budgets are long range propositions and prepared two years before committing the funds, a continuous review on a coordinated basis would be profitable.

5. In certain areas, particularly Armament, Airborne Equipment, and Electronics, there is not a clear cut delineation of duties and division of effort.

6. Delegation of authority is weak in that project officers or coordinators have responsibility without authority over the component divisions. The lines of communication are not established for ease of operation. Project officers may be junior to the component branch personnel.

7. The span of control exercised by the Assistant Chief of Research and Development is greater than should be exercised, especially when the position is held by officers rotated frequently.

8. The authority and responsibility of civilian

personnel is not clear or uniform, but appears to depend on a continuous struggle between individuals and job descriptions. However, there does not appear to be a means for promotion and recognition of merit for civilian personnel as in industry. Stagnancy and lethargy result in application of Parkinsons Law, where seven people are required to replace one worker.

CHAPTER V

ORGANIZATION TECHNIQUES IN INDUSTRY

Industry has met the same problems faced by the Research and Development activities in the Bureau of Aeronautics. With increased complexity of equipment, long lead times, highly trained personnel, increased facilities, and increased costs, planning has become the essence of scientific management. Organization as such is considered important but not the guiding factor. Some companies have no organization chart, since duties and functions have grown along with the personnel. In the Grumman Aircraft Engineering Corporation we find the janitor services under the Treasurer because the company started that way, and the individual who has always held the Treasurer's billet can control the job easily.[1] Similarly, some individuals have billets termed Vice President, whereas as soon as that individual retires, the billet will fall back into the echelon where it belongs in relation to its duties.[2]

Frequently, we see violations of the principles of organization. However, there are generally good reasons behind departures from the normal. Some firms have large

[1] Titterton, G. F., Vice President, Grumman Aircraft Engineering Corporation, Lecture, George Washington University, Washington, D. C., October 8, 1955.

[2] Feiel, G. W., Controller, Republic Steel Co., Lecture, George Washington University, Washington, D.C., October 4, 1955.

CHAPTER V

CONCLUSION

[illegible] was one of the main problems faced by the Treasury and Development authorities in the Sudan's development activities. With increased complexity of implementation time, scarcity factors multiplied, increased flexibility, and improved skills, adoption has become the essence of administrative management. Organization is also to maintain important but not too rigid rules. Some measure [illegible] or disequilibrium exist, since forces and resistances [illegible] along with the movement. In the economic concept Government is first the basic machine using the resources [illegible] the economy channel that way, and the initiative and [illegible] stage both the Treasury's skills are needed to [illegible] stability.[1] Stability, some initiative have diffuse economic [illegible] Plan Creation, however we have an initial [illegible], the nation will fail when into the economic sense it [illegible] to maintain [illegible].[2]

Finally, on the definition of the principle [illegible] of resources. Secondly, there are economic need reasons [illegible] from the economy. Some risks have been [illegible]

[1] Stanley S. Ely, Plan Problems, Economic Planning, Implementation Techniques, Secondly, Economic Planning Institution, Ed. Oxy, Oxford, Ed, 1971.

[2] Wahab, M. A., Sustainable, economic trend Co., Centres, Change Economic Strategy, Washington, D.C., October 4, 1970.

numbers of personnel, as in the consulting or advertising business. Basic reasons behind the large numbers of vice presidents have no relation to the size of the organization, but more to the desire for recognition in dealing with customers and reward for long and outstanding service.[1] Management does not need large numbers of such titles to be effective. DuPont has actually decreased the number of vice presidents in recent years to a number of nine.

In industry we generally find that a typical organization is divided into key divisions such as operating divisions plus financial organization and possibly sales. The Johns-Manville Corporation is no doubt organized under the guidance of an expert on such a subject, since Mr. Alvin Brown is the Financial Vice President. The President or Operations Officer controls the nine Operating or Product Divisions directly with the following staff divisions reporting to him: Production, Sales, Industrial Relations and Comptroller for Financial Analysis.[2] Several other companies have similar organizations with Financial Management and the Line Operating Divisions reporting directly to the boss.

[1] Wier, G. H., Comptroller, Commonwealth Edison Co. Lecture, George Washington University, Washington, D. C. March 8, 1956.

[2] Shakelford, J.N., Comptroller, Johns-Manville Co. Lecture, George Washington University, Washington, D. C. March 6, 1956.

Republic Steel Company has a Vice President Sales, Vice President Operations, and Vice President Financial.

There are certain factors and functions which industry uses to an advanced degree, which are not usually found in a government agency. First, they plan for profit, which requires that all projects support the objectives. Secondly, they are continuously measuring performance, and follow-up action must be fast to prevent losses. Budgets and variance analysis are used to check performance against plans. Thirdly, industry believes in the ability of man and are ready to recognize contributions and merit. Communication upward is encouraged and rewarded. Fourth, functional or centralized organizations are disliked since they require more coordination and initiative is not delegated to those most capable of using it. Functions are related to products not other functions.[1]

However, industry also has many faults which are more or less recognized. Outside consultants are called in just to furnish the boss the same views from an independent source that he wouldn't listen to from his personnel. Some individuals still make snap decisions of questionable merit and either ram it down the throats of their personnel or

[1] Worthy, James C., "Organization Structure", Air Force Executive Development Manual, p. 8.

request corroborative evidence rather than request helpful criticism. Frequently the span of control is too large and key men are overworked.

In the use of executive committees, there is a variation from an overall committee,as at DuPont, to smaller committees. DuPont uses a nine member executive committee of Board of Directors chairmanned by the President. Mr. Greenewalt states that they take most of the month preparing for their bi-monthly meetings. This committee is useful for planning, selection, and review of projects. One product manager stated that he would prefer a review of a new project by such a committee of wide experience rather than take a chance on a decision by any single individual.

Almost all companies utilize a Finance Committee, which in effect provides considerable planning emphasis. Mr. Voorhees, Financial Vice President of U. S. Steel can also be found on the top planning committees of Johns-Manville Corporation. Financial analysis is a control tool used by management to help make decisions.

A compilation of the engineering organization of an aircraft company based upon a review of the operations of Glen L. Martin, North American, Grumman, and Douglas Aircraft Companies indicates substantially similar engineering groupings. A project engineer has coordinating functions

on a horozontal level with the straight staff engineering divisions. Typical engineering divisions are named aero-dynamics, structures, armament, electrical, design, mechanical, electro-mechanical, control systems, instruments, and several others. In some cases, the project engineer will establish a group of representatives physically located from appropriate specialties. The groups will vary with the state of the project and are quite fluid in size. One recent change is the combination of control systems with the electrical organ-ization as a weapon system control group as in North American Aviation at Columbus.

Aircraft company engineering organizations are formed with an eye towards ease of operation with the Bureau of Aeronautics. However, they vary considerably in omissions and additions. No company appears to have a breakdown such as airborne equipment, armament, and electronics, although most companies include a production engineering and a financial group. Also, a planning section or committee is frequently found.

CHAPTER VI

PLAN FOR REORGANIZATION OF RESEARCH AND DEVELOPMENT

A. As a result of the organizational analysis discussed previously, the following objectives are outlined as items worthy of attention.

1. Provide a Research and Development Organization that can operate as an integrated part of the present Bureau of Aeronautics organization. Since the functions, responsibilities, and duties of the new Plans and Programs Organization are not firm at this time, assumptions will have to be made. It is estimated that the Plans and Programs office will not only be advisory to the Chief of the Bureau as a staff agency, but it will assume line functions which will in effect place it on an echelon between the Chief and the operating Assistant Chiefs. If Plans and Programs operates as a staff organization, it would be the focal point for contact by Chief of Naval Operations and the advisor, planner, and follow-up staff agency for the Chief. If Plans and Programs is delegated overall coordinating and line operations, then program operations management will move from Research and Development. At this writing, it is assumed that Plans and Programs will perform as a staff group and recommend coordinating action to the Chief when necessary.

2. Provide Research and Development with a planning organization to integrate the Research and Development budgetary program.

3. Utilize the budget as a management control tool by coordinated review of planning versus progress.

4. Provide so-called class desk engineering project control on a revitalized level with live contact with the Chief Engineer.

5. Provide for project management control and coordination with divisions outside Research and Development.

6. Reduce the span of control of the Assistant Chief of Research and Development.

7. Provide for a live relationship between the Assistant Chief and the line program managers. Utilize staff divisions to provide functional duties.

8. Utilize committees for surveying broad trends and integrating programs.

9. Provide line organization with authority and responsibility in accordance with coordinating duties.

10. Revise the duplication and overlapping of functions between the divisions, especially Airborne Equipment, Armament, and Electronics.

ASSISTANT CHIEF

RESEARCH AND DEVELOPMENT

DEPUTY

SYSTEMS PLANNING DIVISION

Air Defense

A. S. W.

Combat Air

Support Aircraft

Aviation Ordnance

Guided Missiles

Training

LINE SYSTEM DIVISIONS

Fighter Aircraft

Attack Aircraft

Patrol Aircraft

Support Aircraft

Guided Missiles

Ship Aeronautical

BUDGET DIRECTOR

ADMINISTRATIVE OFFICER

TECHNICAL DIVISION

Aerodynamics & Hydrodynamics

Structures

Standards

Facilities

Research & Evaluation

LINE COMPONENT DIVISIONS

Power plants

Avionics

Aeronautical Equipment

B. In order to meet the objectives of the reorganization plan, the organization chart as shown above is recommended.

1. The Assistant Chief for Research and Development is considered to be a key operating vice-president of

an engineering company, like the wartime organization of Grumman Aeronautical Engineering Co. Unless the engineering product, the aircraft, is optimum, the company, or the Bureau of Aeronautics fails in its mission. The Assistant Chief should have live contact with his line operating divisions as in industry to insure that operations are continuously profitable or successful.

2. The basic organizational breakdown consists of a Systems Planning Division, Line Operating Divisions, Technical Division, Budget Director, and Administrative Officer. This division of effort provides for the addition of a planning organization , the elevation of the aircraft design desks to division status, the coordination of technical staff functions into one division, the separation of budget and fiscal functions, and collection of administrative functions in one office.

3. The Systems Planning Division is a staff division for the Assistant Chief, similar to an executive committee in industry as at DuPont. The Planning Division would be organized to reflect the breakdown of activities in the offices of Chief of Naval Operations, the Assistant Chief for Programs and Plans, and the other Bureaus and Offices of the Navy Department. A suggested breakdown of avenues of interest are Air Defense, Combat Air, Anti-Submarine Warfare, Support Aircraft, Guided Missiles, Aviation Ordnance, and Technical Training.

The Planning Division would be responsible for surveying trends and formulation of coordinated programs. Also, this group would provide the medium for integrating the research and development projects into a cohesive program both in the formulation of the budget, and continuous review of progress and changes in effort.

Members of the Division would be available to represent the Assistant Chief at various meetings inside and outside the Bureau. Since these members also have a close contact with the line divisions, they would be in a position to reduce the load from those divisions in Chief of Naval Operations and inter-Bureau conferences. This Division would be expected to maintain contact with fleet operating problems with aircraft.

4. The Line Operating Divisions consist of the present aircraft design desks, the ships installation division, and a realignment of the component divisions. A suggested breakdown of the Aircraft Systems group is Fighter, Attack, Patrol and Support Aircraft Divisions. The Ships Aeronautical Division would be similar to the present Ships Installation Division with responsibilities in system and component development. The Guided Missile Division would be similar to that now existing. The Component Divisions would include the following categories: Power Plants, Avionics, and Equipment.

5. The Aircraft Systems Divisions and Guided Missile Division include the functions and responsibilities of the

class desk concept. In order to insure and improve the coordination function within Research and Development, a modification of the organization of the class desk is recommended. To provide technical know-how, a continuous background of information, and close connection with the component divisions, the class desks should be expanded to provide civilian billets to be transferred from the technical branches in the necessary fields such as electronics, equipment, and armament. Acting as an engineering project manager, the class desks should improve their ability to make decisions and across board coordination with component divisions. Class desk counterparts are listed in some component divisions, but physical location in the design division would be a distinct improvement. Industry is filled with examples to show that personnel must physically move in order to insure a definite change, as compared to use of dotted lines on a chart. This action would permit ease of operation on the part of contractors' representatives who desire coordinated decisions.

The Guided Missile Division would continue to operate similar to the manner now in progress. However, certain functions should be reviewed so that responsibilities are more in line with those of the class desk and the component divisions. It is noted that the Guided Missile Division does have civilian representation unlike the class desks, but the representation should be specifically tied to component division responsibilities and titles. The

component divisions should have a hand in performance rating of the civilians.

The Component Divisions are listed as Aeronautical Equipment, Avionics and Power Plants. The Aeronautical Equipment Division would include both Airborne Equipment and Ground Support Equipment. Airborne Equipment would include instruments and all equipment, other than electronics systems, plus weapon delivery equipment and installations now handled by the Armament Division. Ground Equipment Branch would be responsible for the development of supporting equipment for aircraft, missiles and weapons. The Avionics Division should include the system cognizance and component development of electrical equipment now handled by Armament, Airborne Equipment and Electronics Division. The Hauck Merrill report provides the basic information and details on such an arrangement.[1]

The Power Plant Division remains substantially the same as now in operation. However, it is recommended that representation be provided in the Aircraft Divisions by the transfer of a power plant installation expert to each division.

[1] Hauck-Merrill, "A Basis for Reorganization of the Research and Development Group of the Bureau of Aeronautics," Pamphlet, 30 September 1955, p. 13.

These experts could be rotated, and civilian promotions would be available to these representatives in the Power Plant Division.

The Armament Division has been split up in this reorganization study with the fire control responsibilities being assumed by a combination Armament, Electronics, or Avionics Division. The Aeronautical Equipment Division would be expected to assume the gun, bomb, rocket, and special weapon installation functions. Armament installation experts would be helpful to the class desks. The focal point for special weapon contact would be furnished by the Aviation Ordnance group in the Systems Planning Division.

6. The Technical Division includes the highly technical organizations who function principally as staff advisory groups to the Assistant Chief, Systems Planning Division, and Line Operating Divisions. This Division would include an Aerodynamics and Hydrodynamics Structures, Standards, Research and Evaluation, and Facilities Branch. Present Divisions under similar names are combined together to reduce the span of control of the Assistant Chief in these technical specialties. A resultant effect will be to reduce the time-consuming representation by these specialists at policy meetings where their talents are wasted.

Certain technical specialties remain the same

while others are combined and enlarged in scope. The most important recommendation is the combination of the Research and Evaluation Division. Since the Evaluation Division has lost its prior coordinating responsibility, present duties fit in with the Systems evaluation studies of the Research Division. It is quite possible because of the stature of the personnel involved, that the combined Divisions might be designated as a staff Division rather than a branch.

The other branches listed are similar in scope to the divisions now involved in their speciality. The Standards Branch would include the Technical Data and Aeronautical Standards Division functions. The Facilities Branch would take over those functions applicable to facilities from the present Experimental Programs Division.

7. The Budget Director, as the responsible financial position, would report to the Assistant Chief, as is the practise in industry and in the concept of Comptrollership. The Budget Director would obtain the organization billets now in the Experimental Programs Division. This group would aid the Planning Division and Assistant Chief in Budget formulation. Budget execution would be under continual review, and major variations and changes would be a subject for decision by the Assistant Chief. The Budget Director is a staff officer with no control function.

8. The Administrative Officer would include in his office the functions that would relieve the Assistant Chief

of personnel and housekeeping duties.

9. It is recommended that the Assistant Chief utilize a senior Deputy Assistant Chief in order to control the operation when he is absent. However, the elimination of staff officers, junior to Division Directors, who have no specific responsibilities, is considered a movement toward improved control. With clear cut delineation of duties in the line product divisions, staff requirements should be reduced to decisions that are the responsibility of the Assistant or Deputy Assistant Chief. Functional coordination is provided by the Technical Division Director.

C. The net result of the above reorganization plan can be summarized as follows:

1. Line operating divisions are reduced from thirteen to nine, reducing span of control.

2. Staff assistants are reduced from seven to one, eliminating roadblocks in line of authority on line functions.

3. Decision making by the class desk or individual Aircraft Division has been improved. Initiative has been improved by reduction of vertical echelons. Technical guidance has been furnished the aircraft officers on an active basis.

4. Industry will be able to gain a decision from one office, rather than providing the coordinating influence.

5. Budgeting will be based on Planning, rather than a collection of projects.

6. Coordination of the technical divisions will be effected by one Division head.

7. The interlocking projects and responsibilities of Airborne Equipment, Armament and Electronics Divisions can be divided with clear cut division.

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